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# SCIENCE NEWS LETTER

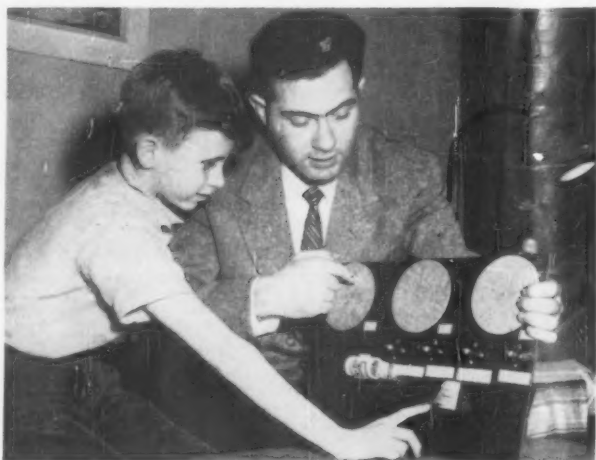
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THE WEEKLY SUMMARY OF CURRENT SCIENCE



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## ASTRONOMY

# Establish Observatory

The United States' first national astronomical observatory, to be managed by an association of seven universities, will be built in Arizona at one of three possible mountain sites.

► THIS NATION'S first National Astronomical Observatory, open to all qualified astronomers, will be built in Arizona with a grant from the National Science Foundation.

It will be managed by a group of seven universities, organized as the Association of Universities for Research in Astronomy, Inc., or AURA, Inc.

A contract for the construction, operation and maintenance of the National Astronomical Observatory has been signed by Dr. Alan T. Waterman, director, on behalf of the National Science Foundation, and by Dr. Robert R. McMath, president, on behalf of AURA, Inc.

California, Chicago, Harvard, Indiana, Michigan, Ohio State and Wisconsin are the seven universities now forming AURA, Inc. These particular universities joined together as a management group for the new observatory because they have had experience in operating large observatories and because they have strong programs of research and graduate instruction in astronomy.

As the project develops, other universities

and individuals are expected to join AURA, Inc., an Arizona corporation with headquarters in Phoenix.

The National Astronomical Observatory will include a 36-inch telescope and an 80-inch telescope, when completed. Its support by the National Science Foundation resulted from a five-year study by American astronomers on needs in their field.

The Foundation's appropriation for fiscal year 1958, which started July 1, includes \$3,100,000 for construction of the optical observatory on a site to be selected after extensive tests. Approximately \$800,000 has been awarded to the University of Michigan for site studies.

Three Arizona locations are now being tested for seeing conditions: Kitt Peak (6,875 feet), the Hualapai Mountains (7,350 feet), and Mormon Mountain (8,440 feet). Two other Arizona sites and one in California were found unsuitable for major astronomical installations.

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**BULLET-SHAPED "MOON"** — A bullet-shaped satellite, weighing 29.7 pounds and measuring 80 inches long together with its final stage rocket, has been designed by the U. S. Army. Technicians at the Army Ballistic Missile Agency at Huntsville, Ala., are shown assembling the satellite and final stage rocket, expected to be put into orbit as a single unit early in 1958.

## AGRICULTURE

# Foresee Drought-Free '58

► PROSPECTS are promising that the Dust Bowl states in 1958 will have the first full year of relief from drought conditions in more than a decade.

Reports received by the Soil Conservation Service of the U.S. Department of Agriculture from state conservationists show that present conditions indicating this are very good.

The reservoirs in the Dust Bowl area are full of water for the first time in many a soil conservationist's memory. Moisture in the ground where farmers and ranchers have been practicing conservation methods is reported enough to last the winter.

All states in the 10-year water-starved areas have reported that for the first time in years they are in good position for going into their growing seasons with adequate water supplies.

The optimistic outlook for the plagued areas is the result of the rainfall that broke the back of the 10-year drought this year. In some cases, particularly in Texas and Oklahoma, the rains were so heavy that they caused the most damaging floods in the history of those areas.

The picture can change by next spring and summer, soil conservationists warn, especially if there is a renewal of the drought accompanied by high winds.

At this time of year, however, farmers and ranchers in the Dust Bowl are looking forward to a promising 1958. Here are

some of the reports received from the hardest-hit states:

Colorado—For the first time in five years water is adequate for all irrigated areas and prospects for 1958 are the best since 1949.

Nebraska—October was the wettest month this year, if not an all-time high. Soil moisture is better this year than for many years.

New Mexico—October was the wettest month in several years and range areas are in better condition this year than in a number of years.

Kansas—Moisture is above normal and there are the best conditions since 1952 for ground cover crops as protection against wind erosion.

Oklahoma—Reservoirs are full and the state harvested its best native grass seed crop, more than 1,000,000 pounds.

South Dakota—The state is going into the winter in the best condition in years with reserve moisture in the ground, less overgrazed pastures, maximum cover against wind erosion and a reserve feed supply. It is one of the best years in at least a decade.

Texas—Reservoirs are full and the moisture conditions in October even delayed the harvesting of some crops.

Missouri—The stock water supply is in better shape now than in the last four years.

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## MANPOWER

# Scientists Forced To Retire Too Early

► THOUSANDS of experienced scientists and engineers are being forced to retire too early when they could perform vital national services, G. Warfield Hobbs, chairman of The National Committee on the Aging, said at its meeting in New York.

"A scientist in the hand is worth two in the cradle," he said, and urged that companies raise their compulsory retirement age from 65 to 70 for scientific and engineering personnel.

"While we are training young people to become the scientists of tomorrow, many mature and experienced scientists of today are being wasted," Mr. Hobbs reported.

He estimated there are now at least 20,000 retired engineers and natural and physical scientists, most of whom are able and anxious to contribute to the nation's defense effort.

Although they may not be fully trained in the latest developments, all have a basic training in the sciences which would enable them to take over many scientific duties.

If only 1,000 scientists and engineers resumed only part time work, it would mean 2,000,000 highly skilled annual man-hours could be added to the national defense effort, Mr. Hobbs concluded.

Science News Letter, December 21, 1957

## EDUCATION

# New Teachers Quit Soon

The problem of educating and training future scientists is complicated by our present teacher shortage and the fact that those in the profession are leaving it.

► EVERY OTHER person who began teaching last year plans to quit teaching in five years. Two out of every ten new teachers last year did not even plan to return to teaching this year.

This surprising and unexpectedly high turnover in beginning teachers was uncovered in a questionnaire survey made by Dr. Ward S. Mason, a specialist in teacher personnel statistics at the U.S. Office of Education, Washington, D.C.

Although only preliminary results are thus far available, the study implies that low salary and lack of preparation are two of the reasons behind the heavy losses among beginning teachers. Another significant factor, however, particularly in women teachers, is marriage and family.

"We suspect," Dr. Mason told SCIENCE SERVICE, "that salary will be important for some kinds of teachers, but not others."

Dr. Mason's preliminary studies of future plans of first year teachers show that, in general, women are far more likely to leave teaching in five years than are men.

The highest percentage of secondary school teachers who plan to leave in five years are those teaching non-academic subjects such as home economics, music and shop.

Of the men in secondary school teaching,

the greatest percentage is in science and mathematics (34%). Statistics on the number of beginning women secondary school teachers in science and mathematics who will leave have not been computed because too few women teachers in these subjects were included in the preliminary sample.

Preliminary findings from the survey, published in *School Life* (Dec.), the official journal of the Office of Education, show:

1. The expected turnover for beginning teachers is nearly 20% after the first year and 50% by the end of five years. This is in comparison to the seven and one-half percent normally chalked up as annual losses to the entire teaching profession through death, retirement and other factors.

2. The turnover is significantly high when matched with the fact that the shortage of qualified teachers last fall was 135,000.

3. Figures on average salaries might shed some light on the heavy losses. The median salary for all beginning teachers last year was \$3,600. It was highest in the Far West (\$4,000) and lowest in the Upper South (\$2,750).

Both a more detailed report and a follow-up study on why the teachers leave and where they go is now being made.

Science News Letter, December 21, 1957

## GENERAL SCIENCE

# Top 1957 Science Events

► THE TOP important advances in science and technology during 1957 as picked by Watson Davis, director of SCIENCE SERVICE, are:

1. Launching of man-made earth satellites, or artificial moons, called *sputniks*, by Soviet scientists, the first placing of an object in outer space into an orbit around the earth.

2. Development of a blunt nose for U.S. missiles that beats their heat death when they return from their outer space trajectory into the atmosphere of the earth, thus allowing H- and A-bomb loads to be carried by intercontinental ballistic missiles.

3. Successful use of vaccine against the world-wide Asian flu epidemic.

4. The Nobel-Prize-winning demonstration that a previously accepted law of matter, the conservation of parity, is not rigorously true in weak nuclear reactions.

5. Photographing of the sun from an unmanned balloon at high altitude showing greater detail of the surface of the sun.

6. Addition of chemical element 102, named nobelium, to the periodic table through synthesis of a small number of its very radioactive atoms.

7. Occupation of Antarctica as part of the IGY, which began in midyear, and the

cruise of the atomic submarine *Nautilus* under the arctic ice sheet.

8. Improvements in electronics and related devices, including a chemical memory device, better batteries, generation of electricity from radioactive heat and new improvements on transistors.

9. Discovery in the blood of schizophrenic patients of a substance that produces the psychotic symptoms in normal persons.

10. The awakening in America, engendered by the Soviet *sputniks*, of the necessity of better and more widespread training of scientists for the future and the need for more basic or pure research to provide technological advances for the future.

Science News Letter, December 21, 1957

## BIOLOGY

## Garlic Juice Stops Cancer in Mice

► GARLIC JUICE has been able to stop the growth of cancers in mice, Drs. Austin S. Weisberger and Jack Pensky, Western Reserve University, Cleveland, Ohio, report in *Science* (Nov. 29).

The juice contains a substance called *allicin*, known to be a powerful killer of bac-

teria, which was tried on the cancers. The scientists used *allicin* because it inhibits certain enzymes but not others. The ones it does inhibit are found in abnormal amounts in some tumor cells.

Since natural *allicin* is too unstable, a similar and more stable compound was prepared and mixed with the cancer cells for ten minutes before the cells were injected into the mice.

None of the mice receiving the treated cells developed tumors, and all remained alive. In contrast, control animals receiving untreated cells developed tumors rapidly.

The compound was also tried in mice after virulent cancer cells had been inoculated into them. Injections of the garlic chemical delayed the onset of malignancy and in some cases prevented it completely.

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## GENERAL SCIENCE

# 1957 Science Review

**First earth satellites launched by Soviets were top science actors in the sky before the International Geophysical Year was far advanced.**

*This summary is limited by space to highlights, and credit to investigators and institutions is necessarily omitted. Most of the events are described in detail in the pages of SCIENCE NEWS LETTER for the current year. If you wish to refer to any particular report, you may find it readily through the index. (See SNL, June 30, and also the issue that will appear next week, Dec. 28.) If you want more information about any item in the summary, send 25 cents to help cover answering costs for each item upon which more information is requested.*

## By SCIENCE SERVICE STAFF

► THIS WAS the year of the sputnik. The earth was given by scientific rocketry its first artificial or man-made satellite or "moon."

Because the Russians beat Americans to this feat and even launched more than one satellite, there was an awakening in the United States that may strengthen the training of future scientists and the support of basic or pure research that provides the fertile seed of future technology. Even if the follow-through is not complete, something will undoubtedly be done in the coming year and there will be benefits to the nation and the world.

The International Geophysical Year (IGY), of which the satellites are a part, began at midyear.

Out of IGY there is coming much new knowledge, less spectacular than sputniks, but possibly more important. The most extensive exploration of Antarctica began, and the South Pole became an American colony. The sun cooperated in the IGY, as hoped, by providing the largest number of sunspots in 200 years.

Upon the wave of apprehension over the evident Soviet proficiency in rockets, the public has received a little more information about U. S. missile progress. We were given to understand that 1,500-mile intermediate range missiles were going into production and that the intercontinental ballistic missiles are lagging not far behind. Hydrogen bomb warheads in large number are ready for them and in fact may be carried routinely by the bombers that are understood to be constantly in the air over strategic areas of the world to counter in fractions of an hour any mad attack on the free world. Promising progress toward a missile that will shoot down atomically attacking missiles was reported.

An important aeronautical achievement is the development and application of a blunt nose for missiles that successfully allows missiles to reenter the earth's atmosphere from their space trajectories without burn-

ing up because of friction. This was literally figured out and tested five years ago by the National Advisory Committee for Aeronautics but only announced this past year. A shock wave of air shields the metal and precious bomb load of the missile from the heat.

Man reaches out into space in a multitude of ways, even though he is not yet himself a traveler who has escaped the gravitation of the earth.

A U. S. rocket rose to at least 2,750 miles and possibly 4,000 miles above the earth and small pellets were projected into outer space and possibly escaped the earth. A man in a balloon rose to 110,000 feet (more than 20 miles) for an unofficial record. Investigations began of the possibilities of powering rockets by drawing upon the chemical energy of matter in the earth's atmosphere 60 to 70 miles high.

From an unmanned balloon at high altitude above most of the atmosphere, photographs were obtained of the surface of the sun showing greater detail than ever before. The sun has eddies as small as 150 miles in

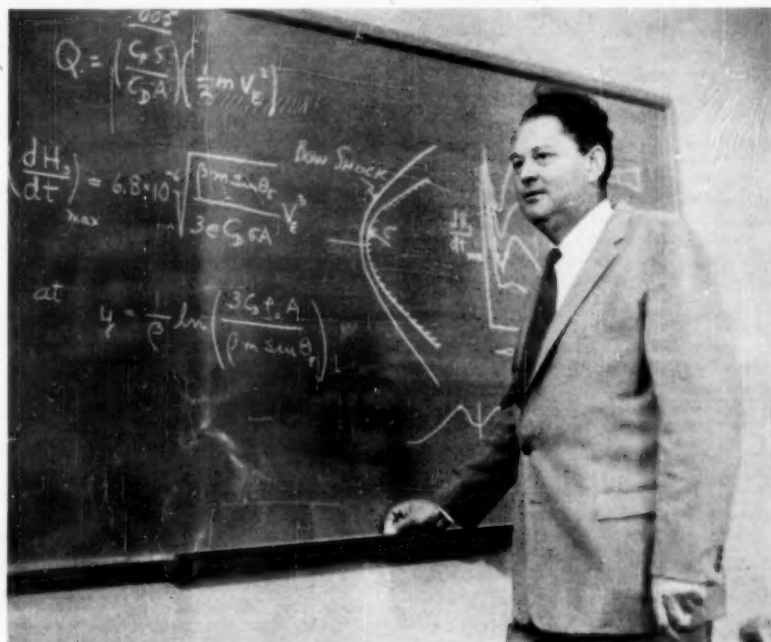
diameter. Larger and more effective radio "telescopes," actually giant saucer-shaped antennae, explored the new universe of stars and galaxies, largely unseen, that are known by their radio emanations. The world's second largest telescope using light, the 120-inch of Lick Observatory, was about to go into operation.

In the less physical exploration of the universe, a previously accepted law of matter, the conservation of parity or the "invariance of spatial inversion" was shown to be rigorously untrue. This research received the unusual accolade of a Nobel prize awarded within the year of its announcement. A new kind of nuclear reaction was found to release energy by a process additional to the fission of the A-bomb and the fusion of the H-bomb but it occurs at relatively low temperatures.

The list of the chemical building blocks or chemical elements was extended by the manufacture of a few fleeting atoms of element 102, named nobelium.

There was rumored progress toward harnessing practically the fusion reaction of the H-bomb. Meanwhile, the building of atomic reactors fueled with uranium continued, with the first big atomic power plant in the United States nearing completion.

New materials and devices added to the potentialities of electronics and related devices. Some of these will improve on transistors and some will provide better batteries. Radioactive heat was made to generate electric current. Minute capsules of photosensitive liquids promised to provide



**MATHEMATICS FOR BLUNT NOSES**—The extreme heat to which missiles are subject during re-entry is overcome as the result of research done by H. Julian Allen of the Ames Aeronautical Laboratory of the National Advisory Committee for Aeronautics, shown computing how it is done. The development, made five years ago and now in use on U.S. missiles, was announced in 1957.

a chemical memory retaining a prodigious amount of information in small space.

High energy chemical fuels, already important in rocketry, progressed to the point where they were being scheduled for use instead of petroleum fuels in revolutionary bombing planes.

More U. S. atomic submarines were being rushed. Meanwhile the first atomic sub, the Nautilus, continued to pile up records and made a long cruise under the arctic ice, a feat long imagined.

From glass there was made a new family of materials, harder than steel, lighter than aluminum, many times stronger than the glass in plate windows. Stainless steel of a new kind was developed so that missiles can travel up to 2,700 miles an hour without heat or friction damage.

The world suffered an influenza epidemic that traveled around the world and affected at least 10,000,000 persons in the United States alone. Caused by a new strain of virus, a vaccine against this Asian flu, reported 70% effective, was rushed into production and widely used. Progress was reported in vaccines to protect against other respiratory diseases, including one type of "cold" and adenovirus-caused cold-like illness. A vaccine, not ready for man, was found to protect mice against leukemia.

The controversy over the relationship between cancer and heavy cigarette smoking continued with presentation of final reports from an extensive study showing that the heavy smokers die seven to eight years before they normally would.

A great research drive on cancer was underway, with the screening of thousands of chemicals of all sorts, in the hope of discovering some drugs that might prove effective. No "breakthroughs" occurred. But experiments on prison volunteers did show that volunteers build up immunity to a second implant of the same kind of cancer, which may help future research progress.

Attacks upon the major problem of mental disease continued with use of drugs, new and old, and other procedures. A promising research development was the discovery in the blood of schizophrenic patients of a substance, taraxin, that was found to produce psychotic symptoms in normal individuals. New drugs were found promising in treating epilepsy and in protecting against death by radiation. New antibiotics and combinations of older antibiotics showed promise for new clinical uses.

In the attempt to understand more about the human brain and its action, it was found that a chemical injected directly into the brain can undo the learning of a single act without affecting other similar behavior.

Coming closer to the fundamental mysteries of life were discoveries in biology and chemistry. The synthesis of ribonucleic acid, which is a vital component of all living cells, was accomplished, and a new kind of this substance was discovered. Mutations were produced in the chemical structures of viruses. A complete bridge between living and non-living matter, composed of filterable viruses, was made visible by the electron microscope.

In the continuing exploration of the past, skeletons of two Neanderthals with tre-

mendous jaws were unearthed in Iraq, mural paintings were discovered in prehistoric U. S. pueblo ceremonial chambers, and North America's oldest wild grain used for food, pigweed, was radiocarbon-dated as 6,800 years old.

#### AERONAUTICS

### Plan Rocket-Type Fuels For New Airplane

Plans were announced for a revolutionary chemical bombing plane using rocket-type high-energy fuels instead of petroleum products.

High energy fuels that increase jet aircraft ranges up to 50% were put into semi-commercial production.

An atomic-powered flying tug to tow gliders across the Atlantic was under design in England.

An ultra-high-strength steel alloy containing titanium, silicon and boron and able to withstand stresses of 285,000 pounds per square inch was developed for use in airplanes.

An alloy of magnesium and thorium, which withstands high temperatures, was developed for airplanes and missiles.

A Doppler radar air navigation system, using a gyro compass corrected for the planes' speed and drift, was developed to compute a course and signal destination.

A new high-speed fixer was put into use that can give an airplane its position when it is hundreds of miles away.

A jet engine, small and light, using variable pitch stator blades in the compressor and capable of powering an aircraft with twice the speed of sound, was announced.

A small jet engine weighing only 250 pounds was developed for airplanes.

A curved-mirror landing system for carrier-based airplanes was introduced and promises to cut accidents by more than one-third.

An energy absorber using a piston and water-filled pipe was developed to stop jet planes on short runways.

A landing gear using two wheels in tandem on each side of the plane made it possible for a 50-ton cargo plane to land safely on hastily prepared airstrips.

A 200-foot, helium-filled balloon lifted almost two tons of military equipment to an altitude of more than 104,000 feet.

A new altitude record for manned balloons was set on Aug. 20 when Maj. David G. Simons reached 110,000 feet (record not yet official).

A new transcontinental speed record was set on July 16 when Marine Maj. John Glenn Jr. flew from Los Alamitos, Calif., to New York in three hours, 23 minutes and 8.4 seconds.

A four-jet tanker was flown 6,350 miles in 13 hours nonstop without refueling.

A turboprop airliner was announced by the Russians to be capable of carrying 200 passengers at 600 miles an hour at cost comparable to rail travel.

#### ANTHROPOLOGY AND ARCHAEOLOGY

### Neanderthals Found In Iraq Cave

The skeletons of two Neanderthals of the "classic" type with tremendous jaws were found in Shanidar Cave, Iraq, together with hearth-fire remains and tools of shipped stone.

A huge jaw bone of Gigantopithecus, between 400,000 and 600,000 years old, was discovered in Kwangsi Province, South China; and indicated that this form was definitely an ape, not man.

The vanished homes of prehistoric people can be located by soil analysis because their waste added phosphorus to the soil, it was found.

Radiocarbon dating indicated that La Venta, major ceremonial center of the Olmec culture, was in use from 2,300 to 2,700 years ago.

Through the cooperation of Communists in East Germany, a love poem from the world's oldest literature was deciphered from the cuneiform writing on Sumerian tablets.

A split-level "shopping center" where Greek housewives did their buying some 22 centuries ago was found in central Sicily.

A chemical method was developed for reversing corrosion and restoring the crumbled copper of ancient documents by exposing it to an atmosphere of hydrogen, a technique applicable to the Dead Sea Scrolls.

The sickle cell, abnormal hemoglobin and cause of a special kind of anemia, was found for the first time in Indonesia.

Dating of fossil man by the order of eruption of his teeth was shown to be erroneous when it was found that there is no essential difference in the eruption sequence between fossil and modern man.

Fingerprint patterns were not destroyed or changed by the heat or radioactivity of the atomic bomb, study of Hiroshima survivors showed.

A total of 50,000,000 people changed their homes in the decade following World War II, an unprecedented movement of people.

Great movements of ancient Americans more than 3,000 years ago were traced through a study of pottery.

Very complete and informative prehistoric mural paintings were found on the walls of ceremonial chambers in a pueblo Indian ruin in the southwestern United States.

Evidence of the "lost" jade mines which furnished gem stones to Mexican artists since Aztec times was found outside Taxco, Guerrero.

Pigweed or amaranth seeds discovered in the American Southwest were dated by radiocarbon at 6,800 years old and were judged to be the oldest known wild grain used for food in North America.

An engineering study of ancient temples in Mexico showed that the pre-Columbian peoples probably used water, chemicals and other natural forces to cut the stone without metal tools.

The making of a saw from bottle glass indicated how pre-Columbian people may have cut wood with hand-made tools of obsidian.

Fossil human footprints left in the sand of El Salvador about 1,100 years ago were found and dated geologically.

#### ASTRONOMY

### Sun Photographed From Great Heights

Photographs of the sun from an unmanned balloon were taken for the first time above most of the earth's atmosphere and showed solar eddies as small as 150 miles in diameter.

The Milky Way galaxy's shape is distorted by tremendous tidal forces, tilting its outer edges with respect to its center plane, radio astronomy studies on neutral hydrogen atoms indicated.

The youngest steller group yet found, only 300,000 years old, was discovered in the Great Nebula in Orion; it was dated by finding the expansion rate from photographs taken 50 years apart.

A life history was worked out for the Great Nebula in Orion in which it was proposed that the first star lived and died within 1,800,000 years, leaving a second generation of very young stars.

Studies of planets and their satellites in the infrared showed the clouds covering Venus are particles of carbon suboxide; confirmed the discovery of carbon dioxide in the Martian atmosphere and a composition of snow for the rings of Saturn; and showed that two of the Jovian moons are covered with snow.

A chemical theory was proposed to explain origin of the solar system, that it was formed at the temperature of deep space and warmed by the action of free radicals.

The debate concerning whether the universe contains the same amount of material nearby as at its remote edges, as determined by the distribution of sources of radio waves, remained unsettled.

Confirmation that the heavy elements formed in the dense cores of massive stars are spewed into space, then used for the formation of new stars, was found from comparison of the sun's composition with that of a hot B star and from laboratory studies of spectrum of carbon at high temperatures.

The interstellar gas from which stars in the Milky Way are formed is being continuously renewed by an outward flow of gas from the galactic center, it was suggested to explain the surprisingly small amounts of interstellar gas found in the Milky Way galaxy and the Andromeda nebula.

An electronic method of image steadying was used successfully to obtain very clear, short-exposure photographs of Jupiter and its moons.

A halo of hydrogen gas was found to surround the M-33 galaxy, thought to resemble the Milky Way in structure.

Lick Observatory's 120-inch telescope, second largest in the world, was readied for operation.

The comparison of atomic time with astronomical time was started.

Of five possible sites studied for the national astronomical observatory, Kitt Peak in Arizona showed great promise.

The world's largest saucer-shaped radio telescope started operation in Manchester, England; the largest in the U. S. was under construction in West Virginia.

Conflicting theories of the cause of polarization of light from a supernova were under study.

New knowledge about the planets included: evidence of life on Mars that may be bacteria; the radio noise broadcast by Jupiter is 100,000 times as powerful as earth's lightning and shows that the planet has an earth-like ionosphere; a rare transit of Mercury was observed.

Three comets visible to the naked eye were observed, one, Arend-Roland, being exceptionally brilliant and having two tails, one pointed sunward.

#### BIOLOGICAL SCIENCES

### Virolysin Explodes Living Cell Walls

A method was demonstrated by which viruses destroyed living cells by forcing them to produce a new enzyme, virolysin, which causes an explosion of the cell wall thus spreading the infection.

The ability of scientists to create tailor-made living matter in the laboratory was predicted; it hinges on finding the specific structure of nucleic acid.

A new and practical chemical method for getting generous amounts of DNA, basic life material associated with chromosomes and genes, was reported.

Mutations were produced for the first time in the chemical structures of viruses.

Differences in electrical conductivity between bacteria, and viruses, and normal and cancerous cells were demonstrated as a possible method for separating biological matter.

The successful breeding and hatching of two whooping cranes in captivity points to a possible way for keeping this rare bird from extinction.

The foot-and-mouth disease virus was photographed with the electron microscope and shown to be round and about one-millionth of an inch in diameter.

Filterable viruses, made visible by the electron microscope, now completely bridge the gap between living and nonliving matter, it was said.

Evidence was reported that bits of plant cells called chloroplasts act as photobatteries, turning sunlight into electrical current and possibly explaining how plants change sunlight into food.

The virus causing aster yellows was found to cause disease in insects as well.

Rat skin was successfully grafted onto mice that had first received transplants of rat bone marrow.

A way was found to propagate single cells of higher plant tissues, promising an important tool for cancer research.

Two new enzymes essential for photosynthesis were found in spinach leaves.

Injured plant matter can poison the surrounding air with carbon monoxide.

A narrow band of light on the edge of the invisible infrared was found to inhibit plant development.

Fish were found to be aided in migration by the sun and birds were found to be helped by both sun and stars, but bats successfully found their way home over a distance of 60 miles when they were blindfolded.

The evolution of geckos for day-loving to nocturnal lizards was found to be shown by the visual pigments of their eyes.

A specimen of a "living fossil," a cephalopod, was found in the mud bottom of Long Island Sound.

Turkey hens were found more likely to produce fatherless embryos after they have had a fowl pox vaccination.

A highly effective vaccine against brucellosis in goats was developed.

Witchweed, a parasitic plant from Africa, was a serious threat to corn and other grain crops during the year. No effective means for control exist aside from quarantine measures and care in keeping microscopic seeds from spreading.

Developments and research with gibberellic acid and gibberellic-like substances indicate these growth-promoting substances which cause gigantism and early maturing in some plants will have far-reaching effects on agriculture.

Small amounts of methane gas, a naturally occurring fuel, were produced by algae in a controlled experiment simulating the algae's natural surroundings.

Industrial uses for agricultural products and research on new crops can help solve the problem of farm surpluses.

In the event of nuclear war, the world's farmers would have to change their practices to grow crops that take up less of the dangerous strontium-90.

Monster grasshoppers with more than one head or more than the normal number of limbs were produced from normal embryos by atomic radiation.

Successful use of air ions, electrically charged molecules, to kill bacteria was reported.

Loss of water in arid areas through evaporation was reduced by using a film of cetyl alcohol extracted from whale oil.

#### CHEMISTRY AND PHYSICS

### Conservation of Parity Proved Untrue

The conservation of parity or the "invariance of spatial inversion" was shown untrue for weak nuclear interactions, thus upsetting a previously accepted law of matter.

A nuclear reaction that releases energy in addition to the previously known fission and fusion was found; the new reaction, called "catalyzed nuclear reaction," involves the negative mu meson acting as a catalyst and is

somewhat like fusion but occurs at a relatively low temperature.

First successful operation was reported of a device based on application of the "maser" principle to solids, using microwave power of the proper frequency to cause changes in the levels of spinning electrons; the device may serve as an amplifier or to measure minute differences in temperature at a great distance.

The world's newest element, number 102, was created by an international team of scientists and named nobelium after the institute in Stockholm where the work was performed.

British atomic scientists reported progress in producing controlled fusion, necessary to harnessing the energy of the H-bomb for peaceful use.

Discovery of a process for practical production of thorium fuel of reactor-grade purity promised to free the U.S. from dependence on uranium for atomic power.

Earthquake waves from hydrogen bomb explosions in 1954 were recorded on seismographs at stations half-way around the world.

Experiments in England with farming on radioactive soil indicated that bringing contaminated land back into use could be speeded by planting crops that pick up a minimum of radioactivity.

The hazards of radioactive fallout from bomb tests, both now and to future generations, and the possibility of producing a "clean" atomic bomb were given intensive study.

A method was developed for photographing atoms and revealing the structure of organic crystals, using neutrons instead of light waves or electrons.

A single unified field theory, covering the spinning of tiny atoms and the gravitation of star-filled space, was found to have been already achieved by Einstein.

Atomic radiation from a bit of radioactive gold was found to increase the burning speed of fuels by 50%.

The Army's portable package atomic power reactor went critical, promising a power source for remote regions without transportation of heavy fuel.

The energy of the 184-inch cyclotron at the University of California was doubled so that it now fires protons of 730,000,000 electron volts.

A new group of semiconductors was made by combining zinc or cadmium with silicon, germanium or tin, and arsenic or phosphorus.

An entirely new method of radio communication over great distances was discovered through using radio signals in the very low frequency range, produced in imitation of the audible radio waves generated by lightning; both the natural and man-made whistlers travel along invisible tubes of force in the earth's atmosphere.

A new standard for measuring the output of X-ray machines was developed; it will help prevent subjecting populations to excessive dosage of X-rays.

The exact energy of a high density system such as electrons flowing in ordinary household wiring was found by application of a new theory with the aid of very complicated mathematics.

Radioactivity in high altitude clouds can be detected from the earth's surface by measuring the positive ion pulses in the air near the ground.

An engineering test reactor, described as "the world's most powerful instrument for the development of nuclear power" went critical.

Research on the effects of shock waves like those that might be produced by an atomic or hydrogen bomb explosion was made possible by a new photographic technique known as a "spark shadowgraph" that stops action in less than one-millionths of a second.

The first recipient of the new Atoms-for-



Peace \$75,000 Award was Dr. Niels Bohr, Danish physicist whose theoretical work opened a new era for nuclear science.

Use of streams of concentrated highly conductive gas, or plasma, was suggested as a method of producing super-strength magnetic fields for high intensity particle accelerators.

Thermonuclear-like reactions, it was reported, can be produced by firing chunks of ionized matter at each other at speeds up to 140 miles per second.

"Whiskers," or fine filaments, of perfect iron crystals were used to study the enormous forces binding atoms together.

A previously unknown process of photosynthesis was discovered which shortcuts the making of sugar and produces protein directly from light energy.

An isotope of plutonium, 233, was discovered, making the 13th known chemical twin of plutonium.

A new isotope, sulfur 35, was added to the five isotopes already known to be produced by cosmic rays in the earth's outer atmosphere.

Synthetic nuclear bomb fallout was produced in a laboratory as an aid in studying what happens when radioactive particles are breathed by animals.

A new generator produced electrical power directly from the chemical energy of hydrogen and oxygen.

Discovery was made of a new material, borazon, that can scratch diamonds and remains hard at temperatures where diamonds oxidize.

Chloroplasts, bits of chlorophyll, were found to act like semiconductors, a discovery which, if confirmed, would necessitate revision of scientists' ideas about photosynthesis.

Fresh evidence was obtained that Fraction I, a plant protein, is important to photosynthesis.

Ribonucleic acid, vital component of all living cells, was synthesized in the laboratory, an important step toward the creation of life.

A new kind of ribonucleic acid, vital component of all living cells, was discovered; it has five nitrogenous components instead of four.

Reduction of the cooking time of foods was found possible by adding glycerine to the water.

Lightning and a primordial mechanism for making energy from a light-sensitive mineral were suggested as having a part in the original creation of life on earth.

Radiation from cobalt-60 was found to speed up the chemical combination of hydrogen and carbon monoxide into hydrocarbons by as much as 60%.

Cellulose was made for the first time outside the living cell.

A process was developed for synthesizing tetraethyl lead for anti-knock gasoline from a wide range of organometallic compounds.

Dyes made from the silicon in sand were found capable of dyeing glass cloth.

A synthetic textile plastic was made from synthetic vanilla, which in turn is made from lignin, the paper industry's most troublesome waste.

The Atomic Energy Commission announced plans to build a "Model C Stellarator," a large device for research on controlled thermonuclear reactions.

The structure of the molecule of cotton was changed so as to make the fiber flame- and smolder-resistant.

The previously rare atomic "ghost particle," the neutrino, was detected at the rate of nearly one per minute, using a giant scintillation counter.

Development of a radically new device called the convergatron made it possible to build an atomic reactor that cannot explode.

A thermionic converter that converts electrons from a hot metal surface directly into an electrical current was developed.

The existence of a complex hydrogen ion,

hydronium, long troublesome in attempts to balance chemical equations, was finally confirmed.

Million-degree temperatures were obtained momentarily in a small transparent shock tube in the laboratory, a finding which may lead to peaceful power from a fusion of atomic cores.

The principle of causality, which holds that no energy can be propagated faster than the speed of light, was determined not to apply in the very tiny region within the atomic nucleus.

A device to purify automobile exhaust, thus preventing some smog formation, was made possible by discovery of a plentiful and inexpensive oxidation catalyst.

Progress was made in exploring the nucleus of the atom; it is no longer considered a hard core, but soft and fuzzy with three concentric zones the outer of which is now well-understood and the intermediate was explored during the year.

Sunshine concentrated by mirrors in a solar furnace furnished temperatures as high as 6,000 degrees Fahrenheit for use in research; a water-stabilized electric arc was used to create temperatures of about 25,660 degrees Fahrenheit which lasted for several minutes; flames were made chemically that reached consistently temperatures of 9,500 degrees Fahrenheit; and shock waves were used to create stellar temperatures momentarily.

Life processes, both the reactions by which green plants store the sun's energy in food and those with which the energy is released from food for life activities, were found to be sparked by the unusual molecular fragments called free radicals.

The 1957 Nobel Prize in Chemistry was awarded to Sir Alexander R. Todd, Scottish-born professor of organic chemistry at the University of Cambridge, for his work on nucleotides and nucleotide co-enzymes.

Drs. T. D. Lee of Columbia University and C. N. Yang of the Institute for Advanced Study were awarded this year's Nobel Prize in Physics for their proposal that the principle of "conservation of parity," held as one of the basic ideas of physics for nearly 30 years, did not hold good in certain types of radioactive disintegrations of atoms.

#### ENGINEERING AND TECHNOLOGY

### Free-Piston Engine Tested in Autos

Free-piston engines in which the exploding gases do not turn a crank shaft but cause the blades of a turbine to revolve, were in experimental use in autos and a ship; they promise great economy of operation in the future.

A jet-powered car capable of going 200 miles per hour was developed to test arresting devices for high-speed jet planes.

A lightweight gas turbine engine weighing only 326 pounds was under development by the Army.

Gas turbines were demonstrated to be practical and feasible for use in heavy duty and military automobile vehicles.

The world's fastest and most powerful locomotive, powered by a gas-turbine-electric engine, was under construction.

An extremely sensitive detector of both light and temperature changes, called a solion unit and containing a solution of potassium iodide, was devised to replace more complicated electronic equipment.

Discovery was announced of the "spacistor," a miniature device like the transistor but not dependent upon high purity semi-conductor materials and operating reliably at much higher temperatures.

A device was designed that uses the heat

from radioactive isotopes to generate electric current and can provide a lifetime power source for electronic equipment.

The Nautilus, first atomic submarine, completed the legendary 20,000 leagues (60,000 nautical miles) under the sea and was refueled. During her cruise, she explored the waters under the Arctic ice pack within 180 miles of the North Pole.

Two series of completely dry batteries that perform at extremely low and extremely high temperature were developed to operate on the addition of ammonia gas and on the activation of silver compounds.

A new solid-state microwave amplifier using a ferrite material as the active element was successfully operated at room temperature.

Discovery was made of a new ferroelectric material, very promising for switching circuits and memory devices.

Silicon carbide, an abrasive, was found to be a high-temperature semi-conductor material.

A new tube called the amplatron was found to improve the performance of all kinds of radars and to amplify the energy output of a radar signal from eight to 14 times.

A new series of materials, including rubber panels, rubber sheets bonded to brass and ceramics, when applied to planes and guided missiles, can prevent detection by radar.

Pliable, flexible lights were made by applying phosphors to nylon, plastics and steel mesh.

Ceramic materials that can be bent through large angles without breaking were developed.

A miniature dry-cell rechargeable battery was invented that is virtually indestructible and is adaptable to transistorized circuits.

Use of a new kind of stainless steel for airplanes and missiles enables them to travel up to 2,700 miles per hour without suffering heat and friction damage.

A new treatment for cotton fabric made it easy to iron, waterproof, oilproof and resistant to heat and rot.

A castor-oil softened diisocyanate plastic foam was found to make a superior crash padding for automobile dash boards.

A technique of encapsulation of droplets of photosensitive liquid in a film made possible the first practical chemical memory for computing machines capable of recording 1,000,000 bits of information to the square inch.

An automatic computer for automatic control of most airplane flights went into operation in one busy flight center.

An electronic computer was under construction that uses a cryotron instead of vacuum tubes or transistors and so will operate at temperatures close to absolute zero where many metals become superconductors.

A paper was developed that can conduct heat and electricity because it contains metal fibers.

Synthetic diamonds, identical to natural diamonds on the basis of optical, X-ray and chemical examinations and hardness tests, were produced in quantity.

Methods introduced for modernizing the handling of the mails included coating stamps with an electrical conductor that can give recognition signals to a machine, which then faces them and puts them in order for the cancellation machine, and a machine that directs letters to their proper boxes after an operator has pressed the proper key.

A method for treating dairy cream with sugar was reported that can keep it fresh at room temperature for as long as six months.

A new family of materials was made from glass; they are harder than steel, lighter than aluminum and 15 times stronger than plate glass.

Developments in experimental magnets included putting an oxide coating over very small particles of a magnetic material so that they cannot be demagnetized by another magnetic field, use of a new kind of silicon and iron



material that permits the magnetism to go around corners, and use of a very fine iron dust to make a cobaltless magnet that will operate in nuclear reactors.

#### GEOPHYSICS

### Geophysical Year Is Study of Planet Earth

The International Geophysical Year, an 18-month world-wide study of the earth as a planet in which 70 nations are cooperating, started on July 1, within hours after the sun had burst forth with an extremely large flare associated with a sunspot, appropriate because the IGY was timed to coincide with expected maximum solar activity.

Three main World Data Centers were established to handle the information gathered during IGY, consisting of many sub-centers to handle data from the 12 special fields. It is expected to require months or years to interpret the mass of data obtained.

The so-called "dawn chorus" of audio-frequency radio waves was found actually to occur at any time of the day.

An undersea mountain range 5,000 feet high was discovered in the Arctic.

The existence of a continuous undersea crack 45,000 miles long in the earth's surface was confirmed.

The sea level of all the northern oceans was found to rise and fall with the seasons, reaching a high point in fall or winter.

A method for dating relatively young rock was developed, using the rate with which potassium-40 decays radioactively into argon.

An unusual case was reported of around-the-world radio reception at very high frequencies 140-thousandths of a second after the direct transmission.

Lignite fields stretching over 100 square miles were found in India.

The size of raindrops was measured automatically, using a new raindrop spectrometer; it takes a million average cloud droplets to form the average raindrop.

Coal mine explosions were confirmed to be related to the weather, due to expansion and contraction of methane gas with changes in atmospheric pressure.

Ocean waves of very low frequency were measured 360 feet below the surface of the sea off Guadalupe Island, Mexico.

Aerial color photography was found useful in prospecting by showing up the changing shades of vegetation that betray underlying mineral deposits.

A simplified method of identifying minerals was developed, using the reflectivity of polished sections as measured by a photometer and a micro-indentation hardness tester fitted to a standard ore microscope.

A new instrument for measuring and continuously recording the speed and direction of vertical wind and temperature fluctuations was devised.

A new prospecting tool for finding hidden mineral deposits was seen in "halos" within the earth consisting of variations of oxygen isotope ratios in surrounding rock.

Evidence was found of a cosmic ray shower in which primary atomic particles bombarded the earth with energies of ten billion billion electron volts.

A deep ocean stream flowing under the Gulf Stream and in the opposite direction, proposed from theoretical considerations, was detected off the South Carolina coast.

A new kind of earthquake wave, called "higher modes of continental Rayleigh waves," was discovered.

An important geological fault was found near Los Angeles, but it is believed unconnected

with the earthquake that shook downtown San Francisco in March.

Fossil finds included: the jaw and parts of the fox-sized *Dilophodon*; the thigh bone of a duck-billed dinosaur; the probable, 100,000,000-year-old ancestor of today's red pine; remains of cave-dwelling reptiles that pre-dated the dinosaur; indications that the plant-eating reptiles, dicynodonts, of the Americas and Africa, belonged to a single family; and skull fragments of a *Diprotodon*, which looked like a giant wombat.

Measurements in a giant cloud chamber indicated clean air may give better chances of rain than polluted air and that cloudiness and rain may remove condensation nuclei to such an extent that rainfall becomes progressively easier.

The President's Advisory Committee on Weather Control reported that statistical evaluation of cloud seeding on the West Coast showed an average increase in rainfall of between five percent and 22% for seeded storms; the results of this evaluation will be checked experimentally by the first randomized cloud seeding experiments which started during the year.

A project aimed at cutting down lightning-caused forest fires by cloud seeding tests completed its first year of operation.

A large deposit of uranium was found to extend from Lake Erie into Tennessee.

The Weather Bureau developed plans to determine whether it is possible to control or modify hurricanes or tornadoes, with the aim of preventing their development.

Better understanding of a hurricane's birth and lifespan resulted from studies of both miniature storms made in a dishpan and a mathematical model of hurricanes.

An experimental method for forecasting the maximum storm tide due to hurricanes and other tropical storms showed encouraging results with Hurricane Audrey, which devastated the Louisiana and Texas coasts in late June, with a loss of more than 300 lives and millions of dollars in property damage.

More than 850 tornadoes struck the United States, causing an estimated loss of 150 lives and \$62,000,000 in property damage.

The first three-dimensional model of the radar presentation of the tornado- and rain-bearing thunderstorm systems known as squall lines was shown.

An electronic computer was successfully used to forecast weather for five days in advance and experimentally on a 30-day basis.

The Weather Bureau inaugurated semi-monthly hurricane probability forecasts.

Thunderstorm electricity was found to be possibly caused in part by frictional contact between ice particles and a cloud as well as a growth of ice pellets in colliding with super-cooled cloud droplets.

A special camera that photographs the entire sky, the horizon and the sea or land surface to 30 degrees below the horizon reflected in a spherical mirror has been developed.

A practical Northwest Passage was found by three American ships and one Canadian ship.

A new technique, fractional sublimation, is aiding research on components of smog; further evidence was found that auto exhaust is the main cause of smog, but that nitrous oxide and other upper atmosphere nitrogen compounds do not produce smog; smog was also found to harm textile strength and dye colors.

The triple-weight hydrogen, tritium, can be used to chart the world's water circulation.

Electronic computers and radar were successfully used to forecast both the height, locality and timing for flood crests and the possibility of flash floods.

The abundance of the elements in cosmic rays was found to differ from that for other matter in the universe, with a relatively higher proportion of light elements, pointing to a possible source in supernovae.

The highest smoothed number of sunspots, 244, in 200 years was recorded in September.

The night sky's faint glow in the absence of moonlight and starlight was proved to be caused by photochemical reactions in the upper air when various chemicals were ejected from rockets on a night flight.

Among the early findings from pre-IGY and IGY programs were the discovery that auroras occur simultaneously at both the North and South Poles; the exact location of the electrojet, a planet-circling system of concentrated electricity found high in the atmosphere above the equator and believed to be responsible for changes in the earth's magnetic field; definite evidence that cosmic rays are ejected from the sun at energies of about 30 billion electron volts; a relation between ionospheric effects and cosmic rays.

The lowest temperature yet recorded at the South Pole was  $-102.1$  degrees below zero Fahrenheit on Sept. 18.

Included among the extensive IGY programs were those for charting the radio signals sent out by some 50,000 thunderstorms daily to learn more about how radio waves travel; studies to find a connection between magnetic storms and the auroral displays in both hemispheres; and a meteor-counting program in which both amateurs and professionals participated.

A technique using a linear seismometer to measure the accumulation of strain in the earth's crust in the Andes Mountains, may result in a way of predicting earthquakes and is being tested during the IGY.

To check the finding that the earth's crust above the Colorado Plateau and Rocky Mountains does not reach down some 45 miles, as would be expected, IGY scientists set off a large number of dynamite charges in the Andes.

Location of the geomagnetic equator was determined by means of cosmic ray research.

Weather observations from Antarctica increased the reliability of Southern Hemisphere weather forecasting.

A successful series of balloon flights established that low energy cosmic ray components decreased during the current sunspot maximum.

Evidence was obtained of daily ionospheric effects at the South Pole during the winter night, caused by something other than the sun.

Study of radio whistlers suggested that the ion density and molecular concentration along whistler paths is greater than was anticipated; there may be a tenuous atmosphere all the way to the sun, largely hydrogen ejected by the sun.

The world's oceanographers initiated a new long-range planning group to continue their cooperation being during the International Geophysical Year.

Storage of weather records was simplified by photographing punched cards on 16-mm movie film and providing an automatic film reader and analyzer.

#### MEDICAL SCIENCES

### Asian Flu Affects 15 Million in U. S. Alone

Asian flu started in northern China in January, swept the Far East and then traveled around the world, affecting at least 15,000,000 persons in the United States. It was caused by a new strain of flu virus sufficiently different from previously known strains that available vaccines were useless against it.

A vaccine was developed to protect against the Asian flu and was reported to be as much as 70% effective.

Another vaccine to protect against respiratory diseases resembling the common cold and

caused by adenoviruses was found to be 98% effective in U.S. Army recruits.

Also reported was a vaccine claimed to be effective against the Jh virus believed to cause one type of "cold."

The U.S. Public Health Service reported use of Salk vaccine caused an 80% drop in paralytic polio cases during the past two years.

Natural immunity to polio was reported increasing even without the use of the Salk vaccine.

In cases of a nonparalytic form of polio, generally called aseptic meningitis, the ECHO type 6 virus was found in the intestinal tract.

All three of the major polio virus strains were crystallized and purified.

Live polio virus was fed to children who had already received Salk vaccine injections in the hope that the combination treatment would offer lifelong immunity to paralytic polio.

Fluorescent dyes were used to speed cancer smear tests by making suspicious cells show up in brilliant colors under a microscope.

The Cytoanalyzer, prototype for a machine for instantly sorting microscope slides containing possible cancerous uterine cervical cells, was developed.

Cervical cell changes were found to be quite common immediately after pregnancy and therefore should not be immediately regarded as signs of developing cancer.

The first successful vaccine to protect mice against leukemia was reported.

Cancer studies on prison volunteers showed the volunteers who had received cancer implants in earlier studies had built up an immunity to a second implant of the same type of cells.

Bone cancers in animals were at least partially destroyed by the use of ultrasonic energy. Heat generated in the bone from the high frequency sound waves appeared to cause the cell destruction.

Ultrasonic echoes were used to diagnose early stages of cancer with a technique similar to that used in radar scanning.

Research was begun on a new form of cancer therapy using injections of a uranium compound which undergoes a small chain reaction when bombarded with neutrons from outside the body.

Cancer growth in mice was stopped by an extract taken from cow ovaries that prevents the cancer cells from "gelling" and then dividing.

The Veterans Administration began using a 16-ton radioactive cobalt machine to treat deep seated cancers.

Normal body cells and blood plasma were found to contain a substance called AI which may prevent formation of cancer-causing chemicals manufactured by the human body itself.

Three antibiotics, Aureomycin, Terramycin and Achromycin, were found to concentrate in cancers and glow under ultraviolet light, possibly providing a basis for new techniques for diagnosis of cancer.

Heavy cigarette smokers die seven to eight years before they normally would if they did not smoke, final results of a 44-month study of 188,000 men between 50 and 70 years old showed.

Critical damage to the lining of the lungs' bronchi or breathing tubes was found to occur in persons who have been smoking for 20 years or more.

A new antibiotic was discovered in the washings from maggots that had been fed on raw meat.

Three new antibiotics, Telomycin, pimarinic and sulfocidin were reported.

A new antibiotic, amphotericin, reported to be the first one effective against histoplasmosis, can also stop a highly fatal fungus disease of the brain.

A combination of the antibiotic chloram-

phenicol and gamma globulin was effective in treating infections that had failed to respond to antibiotics alone.

Widespread use of antibiotics was blamed for the apparent increase of a fatal fungus disease that starts after antibiotics have killed off the body bacteria normally competing with the fungus for food.

Research with the microorganisms that produce many antibiotics showed cross breeding might be used to produce new and better types of the wonder drugs.

Over 3,000 cases of severe reactions to penicillin have occurred since 1953 and the number of bad reactions is increasing every year. The Food and Drug Administration announced.

Strains of bacteria that have developed resistance to penicillin were found even in persons who had never had the antibiotic.

Dangerous reactions to penicillin in penicillin-sensitive persons were quickly relieved by injections of the enzyme penicillinase.

Penicillin was found to destroy bacteria by stopping the formation of the hard protective wall found around bacterial cells.

The U.S. Food and Drug Administration began development of a dye that can be used to mark milk given by penicillin-treated cows.

Reserpine, one of the earliest tranquilizing drugs, greatly extended the lifetime of mice in the advanced stage of leukemia.

The tranquilizer chlorpromazine was found to prevent the damage caused by experimentally produced heart attacks in animals and will be studied in humans.

Large doses of the widely used tranquilizer chlorpromazine were found to produce convulsions in monkeys and the drug was judged to be dangerous under certain conditions.

Development was begun on a pill for protection of humans against death by radiation, using a chemical called AET which is reported to be 100% effective in mice.

Unborn children of a man exposed to neutron radiation from an atomic bomb will have their lives shortened on the average of 20 days for each unit of radiation their father received, it was reported.

Experiments on normal human cells showed the 10-roentgen maximum safe dose of radiation

to the reproductive organs from birth to 30 years age, set by the National Academy of Sciences, is three to five times too high.

Dangerous strontium-90 in milk, resulting from atomic fallout, can be removed by decalcifying the milk and then rebuilding it with calcium from an ancient source such as limestone.

Injections of methionine, an amino acid compound, reduced X-radiation damage in animals exposed to heavy doses of whole body radiation.

The anti-malaria drug chloroquine was reported to be 70% effective against rheumatoid arthritis and to work in a way completely different from cortisone and its derivatives.

Two new drugs for arthritis, Medrol, a hormone resembling cortisone, and triamcinolone, another new hormone, were reported to be better than any drugs known previously.

A simple test was devised for diagnosing cases of rheumatoid arthritis that gives results in 20 minutes instead of the several days usually needed for older tests.

An anti-TB drug called iproniazid turned out to be also effective in treating both psychotic and arthritic patients.

A rapid injection of cold blood plasma was found to bring heart attack patients out of shock within 60 seconds; the dramatic effect is believed to come from the stimulation of the heart by the cold plasma.

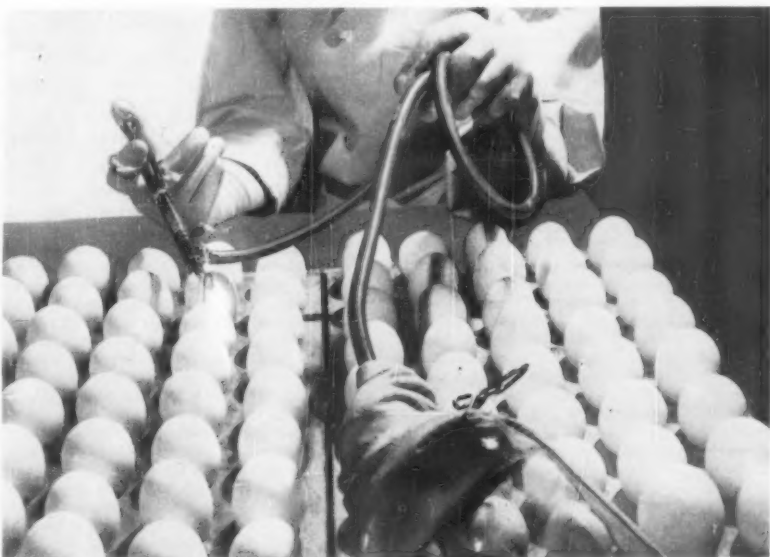
The enzyme plasmin dissolved dangerous blood clots after they formed in animals and was tested in human heart attack cases.

A new diuretic drug, chlorothiazide, was reported to be a potent blood pressure lowering agent, and successfully treated cases of high blood pressure not responding to other drugs.

An artificial section of aorta, made of "no-kink" nylon was successfully used in more than 200 persons to replace clogged arteries and to keep blood flowing from the heart to the legs.

Lungs taken from monkeys were used as half of a heart-lung apparatus to breathe for human patients undergoing heart surgery.

Another new diabetic drug called DBI was reported effective in both mild and severe cases when taken by mouth to replace insulin injections.



**ASIAN FLU VACCINE**—Millions were saved from disabling illnesses during the world-wide influenza epidemic of 1957. Here a laboratory technician injects the eggs in which the vaccine is grown.

A new rewarming technique using forced breathing and oxygen was successful in reviving rats that had been kept frozen for as long as one hour after heart and lungs had ceased to function.

The sex of human embryos can be determined as early as the third week of pregnancy by microscopic study of the cells.

Successful treatment of sickle-cell anemia with the diuretic drug acetazolamide was reported in one case of the blood malady.

The exact chemical difference between sickle cell hemoglobin and normal hemoglobin was discovered, the first description of the exact chemical consequence of an abnormal gene.

Cases of a disease that has all the symptoms of scarlet fever but is not caused by the same germ were reported.

A new epilepsy drug called phenaglycodol was reported to be effective in mixed types of epilepsy, and for both petit mal and grand mal seizures.

A synthetic pain killer that works faster than morphine and appears to be free of the older drug's tendency to slow down respiration was reported.

Corneal transplants for eye surgery were found to be good after storage for as long as two years after dehydration in glycerine.

"Anorganic bone" made from animal bone that has been treated with an organic solvent, was successfully used to repair defective human bone.

Cases of leg gangrene were successfully treated with a "walking cure" that avoided amputations if the patients got out of bed and walked around in spite of their ailment.

A rare surgical transplant of the four parathyroid glands from a still-born baby to a 36-year-old veteran was performed successfully.

A new eye-drop solution for controlling glaucoma was reported to be effective in many cases of the eye disease that are not helped with present drugs.

A man's sight was saved by an unusual operation in which moisture from the mouth was routed to the eye after its tear glands had stopped functioning.

A "radio pill" that will broadcast medical information from the stomach after it is swallowed was developed.

A sealed-off "metabolic chamber" was used for studying body processes of human beings kept in a controlled "climate" for long periods of time.

An enzyme named ficin, taken from the juice of a fig tree, was used to speed the treatment of burned human skin by dissolving away the damaged tissue.

A new synthetic steroid, called SC-5233, was found to stop the body from retaining the sodium in salt.

A new type of hemoglobin, tentatively named hemoglobin L, was discovered in the blood of a Punjabi Hindu.

Human blood belonging to blood group A was found to contain a special type of sugar, a nitrogen-containing disaccharide.

An "isotope univac" was developed to measure the total amount of blood in the body by the use of radioactive blood cells.

A long-term study was begun to determine if Orinase, a new insulin-replacing drug, could prevent the development of diabetes in persons known to be susceptible to it.

The U.S. Public Health Service advised against the use of anti-tuberculosis vaccine BCG in large scale vaccinations, but recommended it in groups where TB exposure was unusually high.

The 1957 Nobel Prize in Medicine was awarded to Dr. Daniel Bovet, a Swiss-Italian pharmacologist, for his pioneering work with anti-histamines and synthesis of a curare-like drug.

The joining of an adult animal's severed

spinal cord was made possible by surrounding the two ends with a special nylon tube.

## PATENTS

### Fungi Used To Make Paper

Numbers following items are U.S. patent numbers. Printed copies of patents can be obtained from the U.S. Patent Office at 25 cents each. Order by number, do not send stamps, and address orders to the Commissioner of Patents, Washington 25, D. C.

Notable and interesting inventions patented during the year include:

Use of an entirely new source of material for the manufacture of paper and paper products, the filaments of fungi. Patent 2,811,442.

Neomycin, an antibiotic that fights streptomycin-resistant disease. Patent 2,799,620.

A process for making golf balls tougher by high-voltage radiation. Patent 2,805,072.

A subminiature radio receiver, small enough to be plugged into an ear. Patent 2,805,332.

A process for extracting powerful plant growth promoters from coconut milk. Patent 2,806,027.

A monorail train system with streamlined supporting structure. Patent 2,788,749.

A process for preparing potato chips tinted in attractive colors for parties. Patent 2,789,056.

A wall-hanging television screen resembling an ordinary picture frame and especially suited to color television. Patent 2,795,729.

Three inventions involving a system of wheel traction, suspension and braking that promise to revolutionize the automotive industry. Patents 2,796,941, 2,796,942 and 2,796,943.

A flexible battery designed to power a soldier's portable radio and that can be worn as a vest. Patent 2,798,896.

Tiny X-ray generators that can be made into needles, capsules or sandwiches and implanted in the human body. Patent 2,797,333.

Hollow, gas-filled, hole-free particles that can float on the surface of volatile products such as gasoline and prevent evaporation. Patent 2,797,141.

A starter for free piston engines. Patent 2,795,927.

Use of an electron beam to drill tiny holes in steel, stone, diamonds and other hard materials in a matter of seconds. Patent 2,793,281.

An electro-fishing device based on the discovery that an intermediate electric impulse rate attracts fish without stunning them. Patent 2,792,659.

A method for transporting coal by pipeline in pulverized form mixed with water. Patent 2,791,471.

A method for separating green cotton bolls from ripe ones when a mechanical harvester is used to strip the plants. Patent 2,791,001.

A high-temperature grease for use on anti-friction bearings. Patent 2,790,769.

An improved semiconductor signal translating device capable of generating amplifying, modulating and translating electrical signals. Patent 2,790,037.

Glowing rugs made from phosphorescent yarn. Patent 2,787,558.

A cordless electric clock that works off a battery and is kept accurate by the induction field emitted by the alternating current home power system. Patent 2,786,972.

A process for recovering germanium-containing material from the liquor formed during the high temperature carbonization of coal. Patent 2,786,750.

An ultrasonic method of cleaning automobile windshields at the factory. Patent 2,784,110.

An automatic photoelectric cell inspector that

reads the labels of drug bottles before they are filled. Patent 2,783,389.

A battery-controlled fire control mechanism for rifles and shotguns insuring a smooth trigger action. Patent 2,780,882.

A transparent, electricity-conducting coating for glass that makes possible a window-burglar alarm, fogless goggles, and clear windshields. Patent 2,808,351.

An electronic device that automatically counts red and white blood cells, preventing errors. Patent 2,807,416.

A photometer system for measuring the air-glow of auroras, twilight sky brightness, eclipse sky brightness and day or moonlight sky brightness. Patent 2,806,405.

A collision avoiding system that automatically stops vehicles under dangerous conditions. Patent 2,804,160.

Processes for using atomic radiation for improving lubricating oils and their additives. Patents 2,801,598 and 2,803,599.

An entirely waterproof compass for use by a swimmer under water. Patent 2,803,068.

A protein food made from soybeans and wheat that makes possible meatless hamburgers, meat loaves and luncheon meats. Patent 2,802,737.

A dry powder mix for making instant seaweed pudding. Patent 2,801,923.

Paper products, from tea bags to gas mask filters, made from synthetic fibers. Patent 2,810,644.

A tough glue made from soy beans. Patent 2,810,657.

A fuel for industrial furnaces made from two waste products, coal silt and spent sulfite from the paper industry. Patent 2,778,718.

A silent jet dart that can be fired like a shotgun shell and is particularly useful for guerrilla-type warfare. Patent 2,777,391.

An Arctic rubber that will not become stiff or brittle at 50 degrees below zero centigrade, made with a by-product of the making of castor oil as a plasticizer. Patent 2,776,693.

A ceramic made from aluminum titanate that withstands thermal shock at 1,700 degrees Fahrenheit and can sustain sudden temperature changes. Patent 2,776,896.

An ambidextrous bat for switch-hitters with a pair of grooves for the little finger and the butt of the palm which will fit the hand of either right-hander or southpaw. Patent 2,775,455.

A method for shooting colored clouds out of a weapon for use by the Army in signaling. Patent 2,775,515.

## PSYCHIATRY AND PSYCHOLOGY

### Stress in Infancy Makes Stronger Adult

Infant rats subjected to the stress of being taken out of the nest daily and handled were found to grow up better able to withstand both mental and physical stresses than those left alone in the nest.

A chemical injected directly into the brain was found to undo the learning of a single act without affecting other similar behavior, the particular learning blocked depending on which chemical was injected, its concentration and the place in the brain injected.

Neurotic children studied were found to get better with time whether they receive psychiatric treatment or not.

The average neurotic patient recovers in between one and two years even without treatment, a statistical study showed.

The night vision of mental patients was found to be inferior to that of normal persons.

The vapor of hexafluoroisobutyl ether which causes violent convulsions when inhaled was tested as a possible substitute for shock treatment for mental patients.



The mentally ill who are not receiving any treatment far outnumber those being treated, surveys revealed.

One Chicago hospital has inaugurated a "mother bank" to provide love and tender care to very sick babies with a history of severe neglect.

The tranquilizing drug meprobamate was found to create the same type of withdrawal symptoms as narcotics when given in large doses to mice.

Encouraging results were reported in the treatment of schizophrenia by increasing the amount of serotonin, a body hormone, in the brain.

Atropine, known as a nerve-gas antidote and dilator of eye pupils, was used in treatment for the mentally ill.

Success was reported when mental patients were taken out of seclusion and treated in a "therapeutic community" where they had the constant help of association with other patients.

Mental patients are being treated in increasing numbers in general hospitals, it was reported.

Ninety percent of the shock treatments used on the mentally ill in Veterans Administration hospitals were eliminated by use of tranquilizers.

Tranquilizers were found to increase scores on intelligence tests when used in treatment of adult schizophrenic patients but they had an impairing effect when given to normal persons.

Flickering light was studied as a possible military weapon because of its distracting effects and the fact that it induces sleepiness, headaches and nausea.

Defects in tooth enamel and brain damage may be due to the same event and tracing the one may indicate when the other occurred.

A beef brain extract was found, in research on Siamese fighting fish, to block the action of LSD-25, a chemical that induces experimentally the symptoms of mental illness in man.

A substance, taraxacin, in the blood of schizophrenic patients was found to produce psychotic symptoms in normal individuals.

The successful recovery was reported of a man whose brain had gone without oxygen for 19 and one-half minutes while a gunshot wound in his heart was being repaired.

A center in the temporal area of the brain was found which, when stimulated, acts negatively to throw the fusion mechanism out of order, causing the individual to see double, hear double and even think double.

The brain reportedly contains a permanent record of a person's past that is like a single continuous strip of movie film, complete with sound track, and he can relive these scenes from his past one at a time when a surgeon applies a gentle electrical current to a certain point on the temporal cortex of the brain.

Experiments with monkeys showed self-applied mild electric currents in certain zones in the brain can serve as a reward while the currents are punishment when applied to other zones.

Evidence was found of the existence of a pacemaker, believed to lie in or near the hypothalamus or brain stem at the base of the skull, which governs the brain waves continually given off by the brain.

An objective indication of when a sleeping person is dreaming was found to be provided by electric recordings of the movements of the sleeper's eyes.

Symptoms of hives, high blood pressure and other psychosomatic illnesses were produced in normal "naive" persons by suggesting specific emotional attitudes to them under hypnosis.

Tests can be given children to detect which ones are likely to grow up to be alcoholics and then by feeding them the right foods the alcoholism might be prevented, it was reported.

Concrete evidence was found that feeble-mindedness of the type known as cretinism can be prevented by prompt diagnosis at birth and immediate treatment with large doses of thyroid medication.

Abnormal sexual behavior and delinquency can be caused by parents who either consciously or unconsciously suggest or foster such behavior in their children, it was reported.

A test was devised for picking the right combinations of people for any small working group.

The hearing of a grasshopper was tested by tuning in on the tympanal nerve; it is relatively insensitive at the low frequencies but its sensitivity improves with higher frequencies at a fairly regular rate of six or seven decibels per octave.

An attempt was made to introduce "subliminal salesmanship" by flashing messages on television or movie screen so briefly that they were below the threshold of awareness, but it was not demonstrated scientifically that such subliminal perception would affect behavior.

Time and space are to some extent interchangeable in human perception, it was found; the time separating two touches with an electrode on your skin affects your perception of the distance they are apart.

Being reared in the dark does not prevent an animal from judging distance or depth, experiments with rats showed.

Isolation from practically all sensation while confined in an iron lung for 36 hours caused loss of awareness of time, confused thinking, inability to concentrate, hallucinations and other psychotic symptoms in normal young men.

Working 30 hours without sleep produced hallucinations and delusions in Air Force volunteers although tests showed little or no physiological change.

Only a fifth of the victims of disaster succumb to panic or shock, study of the victims of a tornado showed.

Review of scientific investigations indicated childhood is not the only plastic period, childhood learning may not have permanent effect and important personality changes can occur in adulthood.

A rat is able to learn the solution of a maze problem by following a leader who has already learned the correct pathway.

A chimpanzee can learn to use his two hands simultaneously but independently, it was found; making it possible to use the chimp as an experimental animal for new kinds of behavioral research.

#### ROCKETS, MISSILES AND SATELLITES

### U.S.S.R. Launches Two "Moons"

Two earth satellites, with rockets and nose cone, were successfully flung into earth-circling orbits by Soviet Russia on Oct. 4 and Nov. 3, both satellites being heavier than those scheduled to be launched by the U.S. in 1958; the second carried the first space traveler, a Laika dog.

The U.S. Farside rocket fired from a high altitude balloon rose to a recorded height of 2,750 miles and may have reached 4,000 miles.

The Moonwatch and Minitrack programs, as well as the 12 Schmidt cameras, proved successful in tracking the earth satellites, and amateur radio operators around the world tuned in on their broadcasts.

Artificial satellites are being named in the same way as comets, with the word "satellite," followed by the year of launching and a letter of the Greek alphabet; a number will be added when more than one object is visible from one launching.

A method was proposed for making earth

satellites easily visible to all by covering the surface with tiny reflecting metal mirrors; the arrangement would also show how fast a satellite was rotating.

Development and use of earth satellites and long-range rockets for peaceful purposes by a United Nations agency and not by individual governments was proposed and discussed by various groups.

A blunt-nosed design for missiles was found to help solve the problem of excessive heat generated when a hypersonic missile re-enters the atmosphere.

Inertial guidance was revealed as a jam-proof system of navigation using floating gyroscopes and Schuler-tuned pendulums, devised so that aircraft, missiles, and ships can operate with no other guidance.

A mobile, optical missile tracking system, consisting of a reflecting telescope and a motion picture camera, was designed; it is powerful enough to photograph an object two inches by seven inches at an altitude of four miles.

A powerful research radar station designed primarily as a research tool for the nation's ballistic missile defense system was successful in detecting two Russian earth satellites.

A test unit was put into operation to simulate in 12 seconds the heat encountered by missiles in traveling through the earth's atmosphere at nearly 5,000 miles an hour.

The possibility of a rocket, powered by the chemical energy of matter in the atmosphere from 60 to 70 miles high, was under investigation in the U. S.

Ion streams were investigated as power sources for controlling and accelerating satellites of the future in interplanetary space.

The Army's Jupiter and the Air Force's Thor, intermediate range ballistic missiles, were both successfully tested.

An Aerobee-Hi rocket smashed the altitude record for a single-stage vehicle by soaring 193 miles aloft.

Development of anti-missile missiles that could be equipped with nuclear warheads was reported encouraging.

An automatic bombing system that eliminates the possibility of pilots being caught in nuclear blasts from their own bombs was developed.

Science News Letter, December 21, 1957

#### NUTRITION

### Predict New Attacks On Chronic Diseases

► NEW ATTACKS on devastating chronic diseases and hereditary disorders were predicted by Dr. Leroy E. Burney, surgeon general of the U. S. Public Health Service, speaking at the annual luncheon of the Nutrition Foundation in New York.

The advances will result from the rapid growth of the science of nutrition, which Dr. Burney characterized as outstanding as the advances in the production of new drugs.

"The production, processing, preservation, transportation and marketing of food of the recent years is as dramatic and as much a miracle as that of pharmaceuticals," Dr. Burney said.

Dr. Charles Glen King, executive director of the Nutrition Foundation, warned against premature conclusions as to the effect of fat in the diet upon blood cholesterol and hardening of the arteries.

Science News Letter, December 21, 1957

Evidence shows that *shad* do return to the river of their origin.



# Books of the Week

For the editorial information of our readers, books received for review since last week's issue are listed. For convenient purchase of any U. S. book in print, send a remittance to cover retail price (postage will be paid) to Book Department, Science Service, 1719 N Street, N.W., Washington 6, D. C. Request free publications direct from publisher, not from Science Service.

**ANCIENT MAN IN NORTH AMERICA**—H. M. Wormington—*Denver Museum of Natural History*, 4th ed., 322 p., illus., paper \$3.65, cloth \$5.25. Including explanation of methods of dating and character of projectile point types.

**ANIMALS IN MOTION**—Edward Maybridge, edited by Lewis S. Brown—*Dover*, 72 p., 182 pl., \$1.00. New edition of the classic work first published in 1887.

**ATOMIC POWER: An Appraisal Including Atomic Energy in Economic Development**—Eugene R. Black and others—*Pergamon*, 151 p., illus., \$3.50. Addresses at a panel discussion of the International Bank.

**CAUSALITY AND CHANCE IN MODERN PHYSICS**—David Bohm, foreword by Louis de Broglie—*Van Nostrand*, 170 p., illus., \$5. Developing arguments for a causal reinterpretation of quantum physics.

**DYNAMIC ASPECTS OF BIOCHEMISTRY**—Ernest Baldwin—*Cambridge Univ. Press*, 3d ed., 526 p., illus., \$5.50. For undergraduate students, organic chemists and clinicians.

**THE ELEMENTS OF PHYSICS**—Alpheus W. Smith and John N. Cooper—*McGraw-Hill*, 6th ed., 671 p., illus., \$7.50. A beginning textbook with emphasis on practical applications of physics principles.

**THE FIRST BOOK OF ARCHAEOLOGY**—Nora Benjamin Kubie—*Watts*, F., 64 p., illus., by author, \$1.95. Telling young people about the work of the archaeologist in unearthing the past.

**THE FIRST BOOK OF SPACE TRAVEL**—Jeanne Bendick—*Watts*, F., 6th printing, 69 p., illus., by author, \$1.95. For the boys and girls who are living at the very beginning of the space travel age, showing them how to sort out the real facts from the fanciful things that cannot be.

**A FOURTH OF A NATION**—Paul Woodring—*McGraw-Hill*, 255 p., \$4.50. Proposing a thorough reorganization of our public schools and universities.

**FUEL RESEARCH 1956: Report of the Fuel Research Board With the Report of the Director of Fuel Research for 1956—Her Majesty's Stationery Office (British Information Services)** 80 p., illus., paper, 86 cents.

**HANDBOOK OF LAYOUT AND DIMENSIONING FOR PRODUCTION**—Hyman H. Katz—*Macmillan*, 479 p., illus., \$15. For design engineers.

**THE HANDICAPPED AND THEIR REHABILITATION**—Harry A. Pattison, Ed.—*Thomas, C. C.*, 944 p., illus., \$14.75. Especially for rehabilitation teams.

**A HISTORY OF THE UNITED STATES AIR FORCE 1907-1957**—Alfred Goldberg, Ed.—*Van Nostrand*, 277 p., illus., \$6.75. In 1907, the War Department called for bids on an aircraft that could carry two persons at a speed of at least 40 miles an hour for 125 miles, the first step toward building an air arm.

**INFORMATION SYSTEMS IN DOCUMENTATION**—J. H. Shera, A. Kent and J. W. Perry, Eds.—

*Interscience*, 639 p., illus., \$12. Discussing traditional and modern automatic systems.

**LENS MAGIC**—Frances Rogers—*Lippincott*, 160 p., illus., \$2.75. Telling children about the use of glass in devices from spectacles to giant telescopes.

**LIVES IN SCIENCE**—I. Bernard Cohen and others—*Simon and Schuster*, 274 p., illus., paper, \$1.45. Biographies.

**MATHEMATICS FOR READY REFERENCE: With Practical Problems and Answers**—H. M. Phillips—*Drake, F. J.*, illus., \$2.50. To help you find the technique it is so easy to forget.

**MODERN MIRACLES OF THE LABORATORY**—Frank Ross Jr.—*Lothrop, Lee & Shepard*, 224 p., illus., \$3. Telling young people the history of chemistry from the earliest development of pottery and dyes.

**NATURE AND THE AMERICAN: Three Centuries of Changing Attitudes**—Hans Huth—*Univ. of Calif. Press*, 250 p., illus., \$7.50. Presenting the basic developments that led to the conservation movement in the U. S.

**NEW CHEMISTRY**—Willard F. Libby and others—*Simon and Schuster*, 206 p., illus., paper, \$1.45. A sampling of modern advances in this science.

**NEW WONDERS IN FLYING**—Marie Neurath—*Lothrop, Lee & Shepard*, 36 p., illus., \$2. For children. Describing some of the strange ideas in aircraft such as the "flying bedstead" and "flying manhole cover."

**NUCLEAR ENERGY IN THE SOUTH**—Redding S. Sugg Jr.—*La. State Univ. Press*, 151 p., illus., \$1.50. Showing what nuclear energy can do for the South in agriculture, industry and medicine.

**THE OLDER PERSON IN THE HOME: Suggestions for Health and Happiness in the 3-Generation Family**—*Govt. Printing Office, Public Health Service Publication 542*, 34 p., illus., paper, 20 cents.

**PLANT LIFE**—Victor Schoenen and others—*Simon and Schuster*, 237 p., illus., paper, \$1.45. The authors are scientists closely associated with the work they report.

**PRACTICAL ASTRONOMY: A New Approach to an Old Science**—W. Schroeder—*Philosophical Lib.*, 206 p., illus., \$6. Encouraging the reader to do some practical work based on this science.

**THE PRINCIPLES OF PSYCHOLOGY**—William James—*Dover*, Vol. 1 689 p., Vol. 2 702 p., illus., paper, \$2 each volume. Inexpensive student edition of the famous classic.

**THE RABBIT STORY**—Alvin Tresselt—*Lothrop, Lee & Shepard*, illus., \$2.50. A child's book telling of the life cycle of the common little wild rabbit.

**SAFETY ASPECTS OF NUCLEAR REACTORS**—

C. Rogers McCullough, Ed.—*Van Nostrand*, 237 p., illus., \$8.50. Collection of papers from the Geneva conference.

**SCIENCE BOOKS FOR CHILDREN**—Verne N. Rockcastle and Eva L. Gordon—*N.Y. State College of Agriculture*, 64 p., illus., paper, 40 c. An annotated list.

**SLOAN-KETTERING INSTITUTE FOR CANCER RESEARCH BIENNIAL REPORT July 1, 1955-June 30, 1957**—C. P. Rhoads, director—*Sloan-Kettering Institute*, 92 p., illus., paper, free upon request direct to publisher, 410 East 68th St., New York 21, N. Y.

**SOURCE BOOK OF INDUSTRIAL SOLVENTS: Volume II, Halogenated Hydrocarbons**—Ibert Melan—*Reinhold*, 267 p., illus., \$7. A reference work for workers in industries using solvents.

**THE STORY OF PEPTIC ULCER**—Richard D. Tonkin—*Saunders*, 71 p., illus., with drawings by Raymond Keith Hellier, \$2.25. A charming book to give understanding and encouragement to the ulcer sufferer.

**SYMPOSIUM ON RADIATION EFFECTS ON MATERIALS**, Vol. I—G. I. Dienes and others—*Am. Soc. for Testing Materials*, 190 p., illus., \$4.75. This symposium is the first of a series sponsored jointly by ASTM and the Atomic Industrial Forum.

**TREES AND THEIR WORLD**—Carroll Lane Fenton and Dorothy Constance Pallas—*John Day*, 96 p., illus., with drawings by Carroll Lane Fenton, \$3.25. An introduction to the trees best known to boys and girls who live in various parts of North America.

**TREES OF THE EASTERN AND CENTRAL UNITED STATES AND CANADA**—William M. Harlow—*Dover*, 2d ed., 288 p., illus., paper, \$1.35. Showing the nature lover how to recognize most of the trees he sees on a hike without the use of jawbreaking botanical terms.

**TUBERCULOSIS: Every Physician's Problem**—J. Arthur Myers—*Thomas, C. C.*, 290 p., illus., \$7.50. How to spot the potential case and prevent serious consequences.

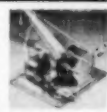
**VITALIZED PHYSICS (IN GRAPHICOLOR)**—Robert H. Carleton—*College Entrance Book Co.*, 4th ed., 412 p., illus., paper, \$1. Using color to aid the student in a quick coverage of the subject or a rapid review.

Science News Letter, December 21, 1957

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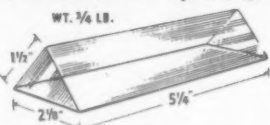
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**PUBLIC SAFETY**

# Reactor Disaster Unlikely

➤ A MAJOR reactor disaster could kill about 50 persons, seriously injure as many as 1,000, and could result in several hundreds of millions of dollars in damages to land.

However, the chances of such an uncontrolled explosion are believed "vanishingly small," Dr. Paul F. Gast of the General Electric Company's Hanford Laboratories, Richland, Wash., reported. The Hanford plant is operated by GE for the Atomic Energy Commission.

He told the First National Conference on Applied Meteorology meeting in Hartford, Conn., that these estimates are based on "theoretical considerations," and could be either under or over by a factor of three. In a major reactor accident, Dr. Gast said, the chief hazard comes from the radioactive fission products accumulated in the reactor core.

In an explosion, these highly radioactive materials would be scattered as tiny particles, sifting slowly to earth as fallout. Most of the fission products, Dr. Gast's calculations show, would not escape from the

reactor building. However, the small fraction that might escape could cause death from overexposure to radiation to anyone within up to 10 to 50 miles downwind from the reactor.

Besides this "non-routine" problem, Dr. Gast also reported on the "outstanding routine" radiation pollution problem: the operation of chemical processing plants. In these plants, the fuel elements that have been irradiated in the nuclear reactor are dissolved, and the uranium and plutonium are separated and purified.

Radioactive iodine-131 has been found to be the most difficult to handle. This could be deposited on vegetation in the surrounding area and there consumed by grazing animals. The allowable limits of atmospheric concentration are therefore set at 1,000 times less than the limit determined by direct breathing of iodine by humans.

Dr. Gast said this extremely low level is typical of the difference in tolerance levels between industrial pollution and radioactive materials.

Science News Letter, December 21, 1957

**PUBLIC SAFETY**

# Exposure Limits Cut

➤ THE PERMISSIBLE LEVELS of radiation for atomic workers and the public has been lowered by two-thirds by the Atomic Energy Commission.

The new standard maximum exposures were recommended by the National Committee on Radiation Protection and Measurement. One basic revision is a new limit on the total radiation dose any individual worker may accumulate beyond the age of 18 to an average of five "rems" per year and not more than 15 rems within any year.

A rem, or roentgen equivalent man, is a dose of any ionizing radiation estimated to produce a biological effect equivalent to that produced by one roentgen of X-rays.

For persons living near atomic installations, the new permissible levels are one-tenth the exposure allowed atomic workers, as in the past.

Another change adopted by the AEC concerns radioactive substances that tend to remain in the human body, either distributed evenly throughout or concentrated near the reproductive organs. The levels have been dropped to one-third those previously specified for occupational exposure to the substances.

The NCRPM had also suggested limiting the radiation exposure to the reproductive organs of the entire population from all sources, including medical and other man-made sources, and background, to not more than 14,000,000 rems per million of population over the period from conception to age 30, and one-third that amount in each decade thereafter. In

accord with this, the AEC requires that its industrial operations must not release any radiation that might be expected to expose the population to an average whole body dosage exceeding one-half a rem per year.

Science News Letter, December 21, 1957

# Questions

**ASTRONOMY**—What three Arizona sites are being studied as possible locations for the projected National Astronomical Observatory? p. 387.

**EDUCATION**—What percentage of teachers leave their profession within five years? p. 388.

**TECHNOLOGY**—How great a speed did the Patterson, a free piston gas turbine powered ship, achieve in its trial runs? p. 399.

Photographs: Cover, Chance Vought Aircraft Inc.; p. 387, U. S. Army; p. 389, National Advisory Committee for Aeronautics; p. 394, Merck Sharp & Dohme; p. 400, Bakelite, Inc.

# RADIO

Saturday, Dec. 28, 1957 1:30-1:45 p.m. EST

"Adventures in Science" with Watson Davis, director of Science Service, over the CBS Radio Network. Check your local CBS station.

Dr. Wallace Brode, associate director of the National Bureau of Standards, Washington, D.C., and president-elect of the A.A.A.S., will discuss "Science at the Indianapolis meeting of the American Association for the Advancement of Science."

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## Do You Know?

In congestive heart failure, there is an increase in the volume of blood as well as in the amount of fluid in the spaces between the tissues and cells of many parts of the body.

In actual flight research dating back to 1950, U.S. scientists have shown that animals, and probably man, could survive flight into the outer reaches of the earth's atmosphere and into space itself.

*Minitrack* receives through eight antennas the signals from the low-power, lightweight transmitter in a satellite; by phase-comparison techniques, the angular position of the satellite as it passes through the antenna beam is measured.

The great declines in salmon runs in the Pacific Northwest have endangered more than a hundred canneries on the Pacific Coast.

### PHYSICS

## Show Supersonic Waves Of Missile in Flight

See Front Cover

➤ A UNIQUE photograph has been produced showing a supersonic shock wave forming ahead of a guided missile in actual flight. The wave appeared immediately prior to the impact of the missile with the earth.

The photograph on the cover of this week's SCIENCE NEWS LETTER shows a Chance Vought Regulus I missile in a terminal straight-down dive on a target. The wave built up ahead of the missile's nose and its angle indicates a supersonic speed of approximately Mach 1.1. Secondary expansion shock waves can be seen opposite and just behind the painted nose.

The photograph was made from a frame of a 35 mm. color movie film shot by the Sandia Corporation in California. It was made through a 60-inch f 5 reflective telescopic lens at a distance of one and one-half miles from the missile.

Science News Letter, December 21, 1957

### TECHNOLOGY

## Power Ship by Free Piston Gas Turbine

➤ THE G. T. S. William Patterson is powered by the world's largest free piston gas turbine.

It is the fourth in a line of war-built Liberty ships to be selected for experimental conversion and engine replacement by the U. S. Maritime Administration. Driven by the 6,000-horsepower free piston engine, the Patterson is the first installation of this type of power plant in the United States.

Clarence G. Morse, chairman of the Federal Maritime Board and maritime administrator of the Department of Com-

merce, called the merchant ship an example of dynamic research. In trial runs in Chesapeake Bay and the Atlantic Ocean, the Patterson achieved a speed in excess of 17 knots under optimum conditions.

The Maritime Administration decided to experiment with the installation of a free piston gas turbine after determining that the engine has potential in mobilization planning since it requires a minimum of

critical materials. Manufacture of this unit can be adapted to mass production techniques.

Studies made to date indicate the overall thermal efficiency of the free piston engine will be high. The new engine was built by the Cleveland diesel engine division of General Motors, and the ship was converted by the Bethlehem Steel Company.

Science News Letter, December 21, 1957

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# • New Machines and Gadgets •

For sources of more information on new things described, send a self-addressed stamped envelope to SCIENCE SERVICE, 1719 N St., N.W., Washington 6, D. C., and ask for Gadget Bulletin 914. To receive this Gadget Bulletin without special request each week, remit \$1.50 for one year's subscription.

⚙️ **BATTERY CARRIER** requires only one hand to carry either a six- or twelve-volt battery. The carrying tongs are almost an inch wide and one-eighth of an inch thick. Adjustable to any width, the tongs have grip claws at the ends for engaging the battery under its rim.

Science News Letter, December 21, 1957

⚙️ **FLAME-RESISTANT ADHESIVE** can be used to glue together cotton, wood, plastic, glass and other decorating materials. Water-based, the adhesive can be thinned with more water, yet remains resistant to water when dry. It can be applied by dipping, brush or spray.

Science News Letter, December 21, 1957

⚙️ **MAGAZINE-LOAD SLIDE VIEWER** is a hand-viewer for color slides in all sizes up to two by two. The slides stay in the sequence prearranged for them. Magnification is said to be seven times slide area. The viewer is available with battery-operated lamp housing or for house current operation.

Science News Letter, December 21, 1957

⚙️ **WINTER CLEAN-UP TOOL** is a combination push broom, snow shovel and ice breaker. The non-matting bristles of the brush are monofilaments made of a styrene



plastic. The brush, when turned over, has a steel blade for scraping and breaking ice. The brush-shovel combination weighs three and one-half pounds.

Science News Letter, December 21, 1957

⚙️ **ROBOT CASHIER** accepts a dollar bill and makes change automatically. In three seconds the bill-changing machine returns two quarters, three dimes and four nickels.

It can be adapted to give out other change from half-dollars to 100 pennies. The machine will accept wrinkled dollars but reject fake or foreign currency.

Science News Letter, December 21, 1957

⚙️ **SMALL VISE** is capable of achieving any compound angle. The vise swings 360 degrees on any tangent to a half sphere, and locks in any position. Its head may be removed by loosening lock screws and lifting out. The unit stands 6½ inches high and is 5½ inches wide with a jaw opening of 2½ inches.

Science News Letter, December 21, 1957

⚙️ **CIRCULAR CALCULATOR** is 6½ inches in diameter and described as doing the work of a 15-inch slide rule. One side is for multiplication, division, square root or proportions. The other side of the cardboard rule has 48 conversion tables.

Science News Letter, December 21, 1957

⚙️ **HEAT CONTROL DEVICE** or thermostat makes possible a continuous flow of heat modulated in temperature with each degree of change in outdoor temperature, as well as fractional indoor changes. It is designed to work with all types of hot-water or warm-air heating systems.

Science News Letter, December 21, 1957



## Nature Ramblings



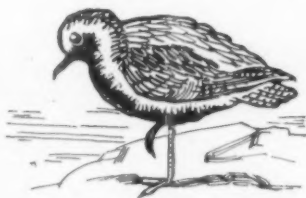
By HORACE LOFTIN

➤ **LAST SPRING**, almost anywhere along the Atlantic or Pacific beaches, or along the Gulf coast, you might have seen a large, handsome shore bird standing with almost comic dignity by the edge of the water. His cheeks, throat and belly would be shiny, solid black, sharply distinct from his whitish back.

From his general shape and the rather short, heavy bill, you would know he was a plover. From his large size, 11 inches, and his black underparts, you would know he was either a golden or black-bellied plover. To be certain, you would have made him fly, and a patch of black feathers beneath each wing in the "armpits" would definitely mark him as the black-bellied plover.

If you go to such a place today, during this winter month, you might see a dull grayish bird of the same shape and size, but lacking completely a distinct and colorful

### Black-Bellied Plover



pattern beneath. There is no question this time, however. This somber bird is the black-bellied plover in winter dress; the golden plover is wintering far in the southern tip of South America now.

Much has happened in the life of this bird between last spring and today.

Shortly after your brief view of him in his nuptial dress, he disappeared from your shores to fly somewhere into the arctic tundras of Alaska and Canada. There he mated in May, and soon was guarding a

nest of four eggs which his mate was incubating. He was a very combative sentinel, and when predatory birds came near the nest he attacked them vigorously, driving away even large gulls and skuas. From time to time he relieved his mate of the duty of incubating the eggs.

The four eggs hatched after 23 days and for some time thereafter both parent birds were extremely solicitous of the young. But in a very few weeks the babies were almost self-reliant. These soon joined other young to form a flock, and our black-bellied plover father deserted wife and children to return to the south for winter. He began to lose the colorful nuptial dress about this time, so that by early fall he was in the drab gray he wears today.

Black-bellied plovers winter from British Columbia on the Pacific and New Jersey on the Atlantic all the way south to Brazil and Chile. How they find their way back and forth each year over their migration path remains one of the great unsolved mysteries of nature.

Science News Letter, December 21, 1957